AN 184 Tom Fox S.N. 937,384 #7 Attach

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 142 924
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 84306494.0

(51) Int. Cl.⁴: C 12 N 15/00

(22) Date of filing: 24.09.84

Sept 26, 1983

(30) Priority: 26.09.83 US 535354

(43) Date of publication of application:
23.05.85 Bulletin 85/22

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) Insect resistant plants.

(57) A method for introducing expressible insecticidal protein structural genes into plant genomes is provided. In the preferred embodiments this invention comprises placing a structural gene for the *Bacillus thuringiensis* crystal protein under control of a plant or a T-DNA promoter and ahead of a poly-adenylation site followed by insertion of said promoter/structural gene combination into a plant genome by utilizing a *Agrobacterium tumefaciens* Ti plasmid-based transformation system. The modified Ti plasmid is then used to transform recipient plant cells. Also provided are the plants and tissues produced by this method and bacterial strains, plasmids, and vectors useful for execution of this invention.

plant ~ T-DNA ??

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will be readily apparent to those skilled in the art. The invention in principle applies to any introduction of an insecticide structural gene into any plant species into which foreign DNA (in the preferred embodiment T-DNA) can be introduced and in which said DNA can remain stably replicated. In general these taxa presently include, but are not limited to, gymnosperms and dicotyledenous plants, such as sunflower (family Compositeae), tobacco (family Solanaceae), alfalfa, soybeans and other legumes (family Leguminoseae), cotton (family Malvaceae), and most vegetables. Pests which may be controlled by means of the present invention and the crops that may be protected from them include, but are not limited to, those listed in Tables 1 and 2, respectively. Because of its susceptibility to a number of larvae, cotton is an ideal choice for the insertion of an insecticidal protein gene. Each of the following is a major cotton pest and is also susceptible to the B. thuringiensis insecticidal protein: Heliothis zea (cotton bollworm), Pectionophora gossypiella (pink bollworm), Heliothis virescens (tobacco budworm), Trichoplusia ni (cabbage looper). Application of insecticidal protein prepared from sporulating B. thuringiensis does not control insects such as the pink bollworm in the field because of their particular life cycles and feeding habits. A plant containing in its tissues insecticidal protein will control this recalcitrant type of insect, thus providing advantage over prior insecticidal uses of B. thuringiensis. By incorporation of the insecticidal protein into the tissues of a plant, the present invention additionally provides advantage over such prior uses by eliminating instances of nonuniform application and the costs of buying and applying insecticidal preparations to a field. Also, the present invention eliminates the need for careful timing of application of such preparations since small larvae are most sensitive to insecticidal protein and the protein is always present, minimizing crop damage that would otherwise result from preapplication larval foraging.

TABLE - 2 -

Plants recommended for protection by B. thuringinensis insecticidal protein

alfalfa
almonds
apples
artichokes
avocados
bananas
beans
beets
blackberries
blueberries
broccoli
brussels sprouts
cabbage
caneberries
carrots
cauliflower
celery
chard
cherries
chinese cabbage
chrysanthemums
citrus
collards
cos lettuce
cotton
cranberries
crop seed
cucumbers
currants
dewberries
eggplant
endive
escarole
field corn
filberts
flowers
forage crops
forest trees
fruit trees
garlic
grapes
hay
kale
kiwi
kohlrabi
lentils
lettuce
melons
mint
mustard greens
nectarines
onions
oranges
ornamental trees
parsley
pasture
peaches
peanuts
pears
peas
pecans
peppers
pome fruit
pomegranite
potatoes
radishes
rangeland
raspberries
safflower
shade trees
shingiku
small grains
soybeans
spinach
squash
stonefruits
stored corn
stored grains
stored oilseeds
stored peanuts
stored soybeans
stored tobacco
strawberries
sugarbeets
sugar maple
sunflower
sweet corn
sweet potatoes
tobacco
tomatoes
turf
turnip greens
walnuts
watermelons